

MARINE RECREATIONAL INFORMATION PROGRAM

FY 2014 Project Plan

**Simulation Study to Evaluate Alternative Estimators of the Mean Avidity of Marine
Recreational Fishing Participants from Access Point Survey Data**

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1. Overview

1.1. Background

The Marine Recreational Fisheries Statistics Survey (MRFSS) estimator of the number of anglers participating in marine recreational fishing (participation) is based on the Coastal Household Telephone Survey (CHTS) estimator of total fishing effort and a secondary Access Point Angler Intercept Survey (APAIS) estimator of angler avidity. The number of participants is estimated by dividing the APAIS estimate of angler avidity (mean number of fishing days per participant) into the MRFSS estimate of total fishing effort (total number of angler fishing days).

The National Research Council's Review of NOAA's recreational fishery survey methods pointed out that the MRFSS APAIS estimators assumed simple random sampling and did not properly weight data to take the complex, stratified, multi-stage cluster sampling design of the APAIS into account. A project team was established in 2011 to develop an appropriately weighted APAIS estimator of angler avidity and evaluate possible bias in the MRFSS estimators of angler avidity and total participation. The MRFSS APAIS estimator of angler avidity was the harmonic mean of the number of days on which interviewed fishing participants reported they had fished during the last two or twelve months. To remove potential for bias in this estimator, the project team worked to develop a properly weighted version that could potentially be used both to evaluate bias in the MRFSS estimators and to calculate more accurate historical estimates of marine recreational fishing participation. However, an analysis of the weighted harmonic mean of reported days fished showed that it is not a design-unbiased estimator of angler avidity under the complex APAIS sampling design. The weighted estimator is likely to be much less biased than the MRFSS unweighted estimator, but the team determined it would be useful to measure the extent of any remaining bias in the weighted estimator. The project team proposes to implement a statistical simulation study to enable us to better understand the performance of the weighted harmonic mean as an estimator of angler avidity.

1.2. Project Description

The first step is to closely investigate the characteristics of angler populations using past MRFSS data. Because the CHTS utilizes a random digit dialing phone survey design, household residents who take very few marine recreational fishing trips should be just as likely as those who take many fishing trips to be interviewed through this sampling approach. On the other hand, the sampling design of the APAIS is much more likely to be subject to an "avidity bias". Anglers who take a lot of fishing trips will have a greater chance of being intercepted and interviewed than those who take very few trips. Thus, we plan to focus on the past CHTS data to study the characteristics of typical angler populations, such as the mean and variance of fishing avidity during a given two month period. The results will be used as the baseline characteristics to define parameter variables and their values to generate various simulated angler populations.

Once the baseline characteristics of a typical angler population are defined, simulations will be carried out under various conditions to generate sets of angler populations with different characteristics with respect to how anglers with different levels of fishing avidity are distributed among fishing sites that differ in fishing activity. For example, a simulated angler population might be distributed among sites and time intervals under the assumption that there is no consistent correlation between the expected fishing pressure and the avidity of anglers fishing within a given site and time interval (i.e., anglers with different level of avidity are randomly assigned to fishing sites and time intervals with different levels of fishing pressure). Alternatively, a simulated population might be distributed under the assumption that angler avidity is related to the expected fishing pressure (i.e., anglers with high avidity are more often found fishing at sites and times with low fishing pressure than at sites and times with high fishing pressure).

Various probability sampling designs, including that used by the APAIS, will be applied to the simulated populations. Estimates of angler avidity and estimated standard errors of those estimates will be calculated using a weighted harmonic mean from the samples drawn iteratively from simulated angler populations. This will allow evaluation of differences between point estimates of angler avidity and the true value in each simulated population. In addition, it will be possible to evaluate the true variance of the point estimator over many independent iterations of sampling. The results will be analyzed to compare and evaluate the robustness of the estimator under different population distribution assumptions. It should be possible to determine the direction and magnitude of any consistent bias in the weighted estimator of angler avidity. This information will prove useful in evaluating the total extent of bias in the MRFSS estimators of angler avidity and participation and in calculating more accurate historical estimates of participation.

1.3. Objectives

The primary objective of this effort is to evaluate the relative robustness of both the unweighted MRFSS APAIS estimator and a new weighted APAIS estimator of angler avidity. The results will be used to better evaluate possible sources of bias in the MRFSS estimator of angler avidity, as well as the performance of the alternative estimator. Identification of a properly weighted APAIS estimator that shows very little bias under a wide variety of conditions is an important objective. Such an estimator could be used to produce revised participation estimates for prior years and allow a good evaluation of the magnitude and direction of any bias in the past MRFSS estimates that relied on the unweighted MRFSS APAIS estimator of angler avidity.

1.4. References

NRC. 2006. Review of recreational fisheries survey methods. The National Academies Press, Washington, D.C. 'Some comments on the use of the harmonic mean' by Jean Opsomer.

2. Methodology

2.1. Methodology

Simulation study

2.2. Regions

Gulf of Mexico, Mid-Atlantic, North Atlantic, South Atlantic

2.3. Geographic Coverage

NA

2.4. Temporal Coverage

NA

2.5. Frequency

NA

2.6. Unit of Analysis

angler

2.7. Collection Mode

NA

3. Communications Plan

3.1. Internal

Monthly conference call meeting and exchange or distribution of materials by email as necessary.

3.2. External

Monthly progress report to the MRIP Operations Team.

4. Assumptions and Constraints

4.1. New Data

No

4.2. Track Costs

Yes

4.3. Funding Vehicle

New contract needed

4.4. Data Resources

MRFSS APAIS and CHTS data

4.5. Other Resources

Survey research firms, academic consultants and/or their graduate students

4.6. Regulations

None

4.7. Other

None

5. Risk

5.1. Project Risk

Table 1: Project Risk

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
Project unable to find suitable consultant/graduate students support in a timely manner	Delay project completion	Low	Initiate the search for appropriate consultant support early in the project schedule
Simulation and analysis proves to be more complex than expected	Delay project completion	Medium	Hire experts in the field to provide technical consulting

6. Final Deliverables

6.1. Additional Reports

Final report summarizing the results

6.2. New Data Sets

None

6.3. New Systems

None

7. Project Leadership

7.1. Project Leader and Members

Table 2: Project Members

Project Role	Name	Organization	Title
Team Leader	Dave Van Voorhees	NOAA Fisheries	
Team Member	Richard Aiken	US Fish and Wildlife Service	
Team Member	Jean Opsomer	Colorado State University	
Team Member	Mike Brick	Westat	
Team Member	Han-Lin Lai	NOAA Fisheries	
Team Member	Jun Rossetti	ICF International	

8. Project Estimates

8.1. Project Schedule

Table 3: Project Schedule - Major Tasks and Milestones

#	Schedule Description	Planned Start	Planned Finish	Prerequisites	Milestones
1	hire consultant	03/01/2014	04/30/2014		
2	kick-off meeting	05/01/2014	05/31/2014	1	
3	simulation study	06/01/2014	08/31/2014	1,2	
4	final report	09/01/2014	12/31/2014	1,2,3	

8.2. Cost Estimates

Table 4: Cost Estimates

Project Need	Cost Description	Date Needed	Estimated Cost
consultant support		05/01/2014	\$45000.00
TOTAL			\$45000.00